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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/650,640	08/28/2003	Leslie Andrew Chewter	TS-1255 (US)	7526

7590

03/22/2006

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EXAMINER
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SINGH, PREM C

ART UNIT	PAPER NUMBER
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1764

DATE MAILED: 03/22/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/650,640

Applicant(s)

CHEWTER ET AL.

Examiner

Prem C. Singh

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 28 August 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 28 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                        | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____  | 6) <input type="checkbox"/> Other: _____                                    |

## DETAILED ACTION

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to

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consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 1-11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Becker et al (US Patent 3,526,674) in view of Becker (US patent 4,273,622).

Becker et al disclose that the process of this invention is especially applicable to the dehydration of alpha-phenylethanol to produce styrene (Column 2, lines 47-48). This invention requires that the dehydration can be conducted in the presence of a liquid phase reaction medium. This liquid phase reaction medium can be either polar or non-polar (Column 2, lines 66-69). Pure aralkanol feedstocks are not required in the process of this invention, i.e., impurities normally associated with such materials have little or no deleterious effect upon the process. Thus, in the case of alpha-phenylethanol impurities such as acetophenone, beta-methylbenzyl alcohol, and benzyl alcohol can be present in the feed to the dehydration in amounts of as much as 20 to 30% by weight (Column 4, lines 48-55). Reaction temperature is controlled to be above about 200°C but below the decomposition temperature of the liquid phase reaction medium (Column 4, lines 60-62). It is desired to avoid temperatures above 350°C, and it is preferred to avoid temperatures above about 330°C (Column 5, lines 1-3). Of the solid catalyst useful in this invention, the use of high purity activated aluminas is preferred since use of these materials gives highest selectivity (Column 6, line 75; column 7, lines 1-2).

Becker et al invention further discloses the apparatus for the conduct of the process of this invention and is presented in the drawing (Column 8, lines 1-4). Alpha-phenylethanol is introduced to reactor (10) via conduit (11). High surface area alumina is also added to conduit (11) via conduit (12) and thus passes to reactor (10) (Column 8, lines 33-35). Reactor (10) is also equipped with an agitation system comprising agitator paddle (14) (Column 8, lines 46-47). The heat is supplied to the reaction system by means of heating coils (19) disposed within the reactor (10) (Column 8, lines 68-70). As the reaction proceeds, the small amount of high-boiling residue formed during the dehydration, together with added catalyst, accumulates within the reactor. When this accumulation exceeds the desired level, the surplus is withdrawn, periodically or continuously, from the reactor via conduit (20) in order to maintain a substantially constant inventory within the reactor (Column 8, lines 71-75; column 9, lines 1-2). The vapor product of the reaction, withdrawn from reactor (10) via conduit (17) is introduced to distillation zone (30) (Column 9, lines 14-16). Within distillation zone (30), unreacted alpha-phenylethanol is separated from styrene and water reaction products. The alpha-phenylethanol is withdrawn from the bottom of the distillation zone via conduit (18) and recycled to reactor (10). Styrene and water reaction products and other volatile reaction products, including trace amounts of aralkane and relatively small proportion of the phenolic foam suppressant (if any) added to reactor (10), are withdrawn from the upper portion of the distillation zone (30) via conduit (31), are condensed in heat exchanger (32) and introduced to distillate drum (34) via conduit (33) (Column 9, lines 25-35). The styrene reaction product overflows weir (39) and is withdrawn from distillate drum (34)

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via conduit (35) and can be used as such or subjected (if desired) to further processing (Column 9, lines 43-46).

Becker et al do not disclose reacting the residue in the second reactor.

Becker et al do not disclose transferring a part of catalytically dehydrated mixture to a distillation unit and a part to the second reactor. Becker et al do not specifically mention about recycling a part of the mixture from second reactor into the first reactor and a part to the distillation unit. Becker et al apparatus does not mention about a conduit for recycle from the second reactor to the first reactor.

Becker invention discloses that a reactor, constructed from a 1-liter round-bottom flask and a 15-tray Oldershaw column with provision for reflux and vacuum, was charged with 700 g of residual material produced in the dehydration of MBA (alpha-methyl benzyl alcohol also known as alpha-phenyl ethanol) and containing 8% of monomeric components (Column 5, lines 52-56). In this manner 54% of the charge was recovered in the distillate and the distillate contained 40% of the charge as styrene and styrene precursors (Column 6, lines 2-5). Becker invention further discloses Example 4, which illustrates continuous operation (Column 7, lines 26-27). A reactor, constructed from a 1-liter round bottomed flask and a 30-tray 1 inch Oldershaw fractional distillation column with provision for reflux and a feed selection below the 15<sup>th</sup> tray from the top was continuously fed with a residual material produced in the dehydration of MBA containing 8% monomeric components at the rate of 60 g per hour (Column 7, lines 27-

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34). In this continuous distillation, the conditions to which the feed was subjected in the column represent the first stage of the 2-step process of this invention and the conditions to which the heavier portions of the feed which pass into the distilling flask were subjected in the flask represent the second stage of the process (Column 7, lines 47-53).

It would have been obvious to one skilled in the art at the time the invention was made to combine Becker et al and Becker inventions and use multiple stages of reactor to increase the production of styrene and decrease the losses going as residue.

It would have been obvious to take a part of the effluents from the second reactor of Becker invention and pass to the third reactor to further increase the styrene production and simultaneously reduce the loss going as high-boiling residue.

It would have been obvious to take only a part of the high-boiling effluents from the first reactor of Becker et al to the second reactor of Becker and a part to the distillation unit to separate the light components and reduce the unnecessary load to the second reactor.

It would have been obvious to take a part from the second reactor of Becker to the distillation column and a part to the first reactor of Becker et al to completely remove the high-boiling fractions by multiple treatments in the reactors.

It would have been obvious to modify Becker et al invention and add a conduit in the first reactor to receive recycle from the second reactor.

***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Winnick, US Patent 4,207,424.

Dubner et al, US Patent 5,639,928.

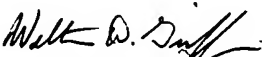
Van Der Sluis, US Patent 6,504,038.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Prem C. Singh whose telephone number is 571-272-6381. The examiner can normally be reached on MF 6:30 AM-3:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn Caldarola can be reached on 571-272-1444. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ps/020606

  
**Walter D. Griffin**  
**Primary Examiner**